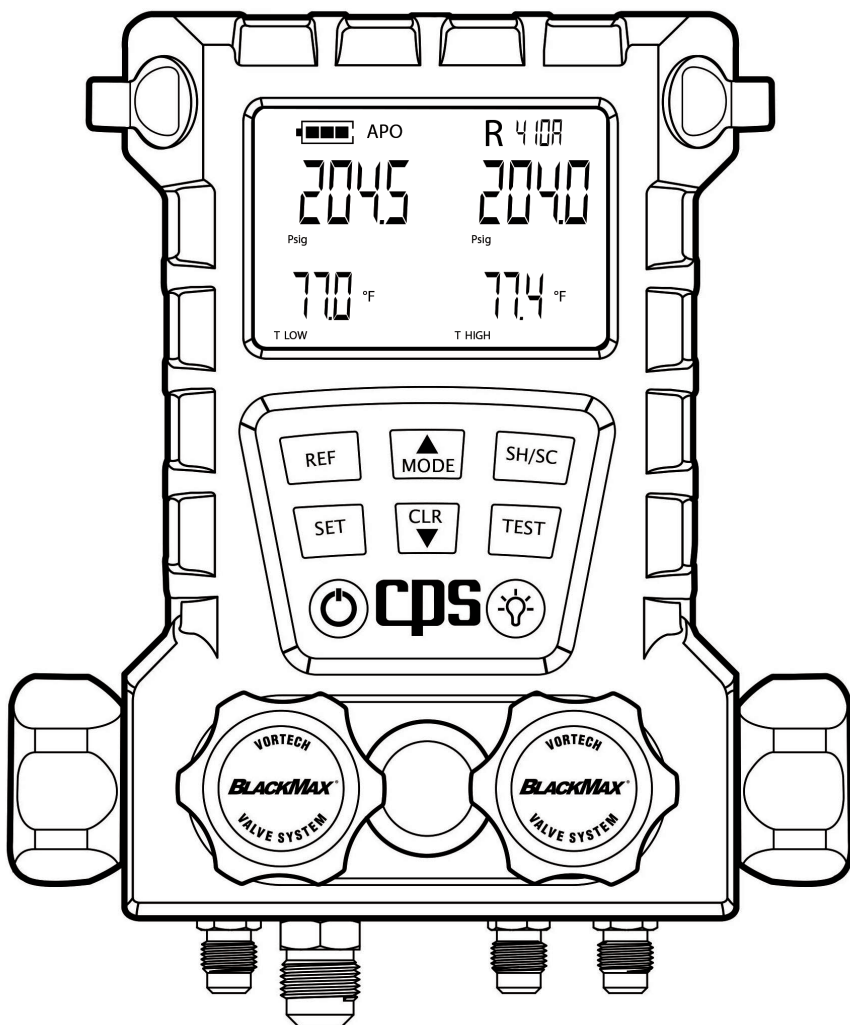


cps[®]

BLACKMAX

Digital Manifold Series




OWNERS MANUAL

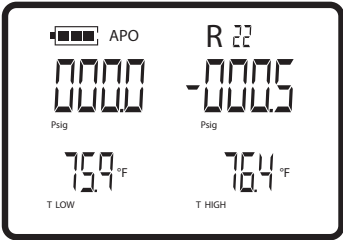
GENERAL INFORMATION

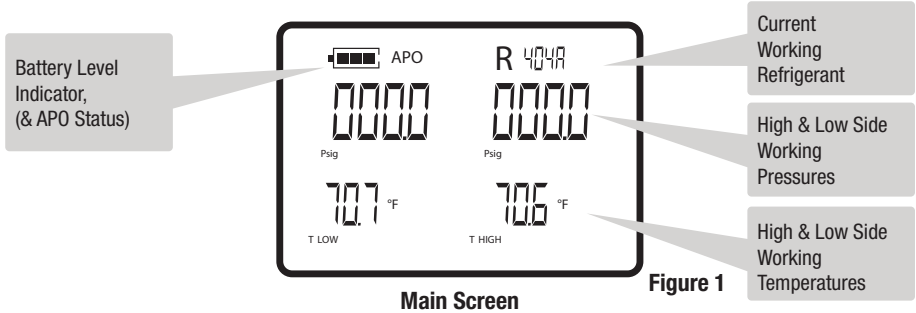
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Quick Start

- 1) Install 4 AA Alkaline (included) or rechargeable batteries into back of manifold.
- 2) Press and hold ON/OFF key  to turn manifold On or Off.
- 3) Welcome Screen -Appears briefly (shows software version & geographic location)
- 4) Main Screen (FIG.1) appears next:
 - Battery charge status/APO (On or Off)
 - High and low side working pressures
 - High and low side temperatures
 - Current working refrigerant.
- 5) Connect MD50 or MD100 to an AC system (Page 10)
- 6) Review and adhere to all safety instructions (Page 2)
- 7) You are now ready to work.





General Safety Instructions

ONLY QUALIFIED SERVICE PERSONNEL SHOULD OPERATE THIS PRODUCT. THE USER OF THIS PRODUCT MAY BE REQUIRED TO BE LICENSED. PLEASE CHECK WITH YOUR LOCAL GOVERNMENT AGENCY BEFORE USE.

Danger - Avoid breathing refrigerant vapors and lubricant vapor or mist. Breathing high concentration levels may cause heart arrhythmia, loss of consciousness, or even cause suffocation. Exposure may irritate eyes, nose, throat and skin. Please read the manufacturers Material Safety Data Sheet for further safety information on refrigerants and lubricants.

Danger- EXPLOSION RISK. Use extreme caution when working with flammable refrigerants. Never use this manifold with oxygen.

Danger- EXPLOSION/RUPTURE RISK. DO NOT use this manifold with unregulated nitrogen, carbon dioxide or other very high pressure gasses. Unregulated gasses can cause components in a refrigeration system to rupture. Severe Injury or Death can occur.

Caution- All hoses may contain liquid refrigerant under pressure. Contact with refrigerant may cause frostbite or other related injuries. Wear proper personal protective equipment such as safety goggles and gloves. When disconnecting any hose, please use extreme caution.

WARNING: Remove all hoses with care as they may contain refrigerant.

WARNING: DO NOT APPLY MORE THAN 900 PSI TO ANY PORT ON THE MANIFOLD. FOLLOW ALL EQUIPMENT MANUFACTURER'S TEST PROCEDURES WHEN SERVICING THOSE SPECIFIC TYPES OF EQUIPMENT.

NOTE: It may be unlawful to discharge or exhaust refrigerants into the atmosphere. CPS strongly recommends the practice of recovery or recycling. Check your local government agencies for refrigerant handling regulations.



GENERAL INFORMATION

Overview

BLACKMAX digital manifolds from CPS Products, Inc. combine the latest manifold design and electronic measurement features into one easy-to-use, accurate and water resistant product in a rugged nylon plastic housing, incorporating a durable elastomeric keypad and large backlit LCD display.

For safety, specially designed pressure sensor cavities eliminate the possibility of user damage even in severe pressure misapplications.

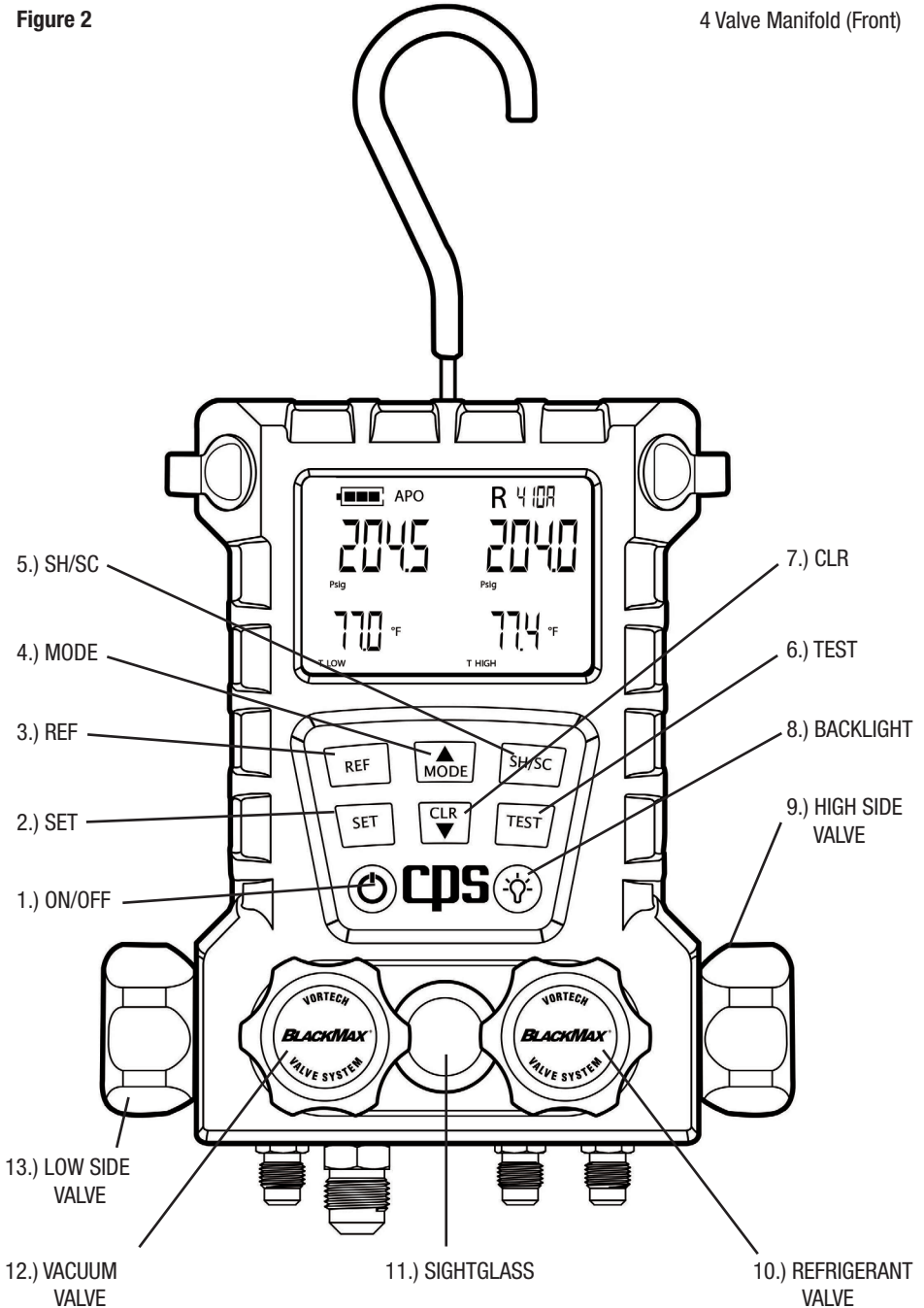
The MD50 & MD100 provide many functions such as pressure, vacuum leak and decay tests. The optional CPS vacuum accessory MDXVG turns the digital manifold into an accurate Vacrometer.

1. **ON/OFF** - Press and hold to turn On or Off
2. **SET**- For entering programmed values
3. **REF** (Refrigerant) - Scrolls through 5 pre-selected “favorite” or commonly used refrigerants
4. **MODE**- Programming (change English vs. Metric units; Turn Auto-Power OFF)
5. **SH/SC (Superheat, Subcool)**- Controls display of Superheat/ Subcool, Saturation temperatures, and Delta T.
6. **TEST** - Press to obtain either “Pressure Decay” or “Vacuum Decay” tests.
7. **CLR** (Clear)- Sets pressure to zero point . Also ends any test in process.
8. **BACKLIGHT** - Press once to turn light On or Off
9. **HIGH SIDE VALVE**- Controls flow to Right Side ¼” SAE Male Port.
10. **REFRIGERANT VALVE (MD100 Only)**- Controls flow through RIGHT MIDDLE ¼” SAE Male Port.
11. **SIGHTGLASS**- Monitor refrigerant flow.
12. **VACUUM VALVE (MD100 Only)**- Controls flow through LEFT MIDDLE 3/8” SAE PORT.
13. **LOW SIDE VALVE**- Controls flow to LEFT SIDE ¼” SAE Port.
14. **CENTER PORT (MD50 Only)**- A ¼” SAE Male “T” port used as common connection to vacuum pump, recovery unit or refrigerant supply tank. The addition of a ¼” SAE Male “T” fitting with valve core allows for a dual hook up between vacuum pump and refrigerant supply tank.

Controls / Features

Figure 2

4 Valve Manifold (Front)

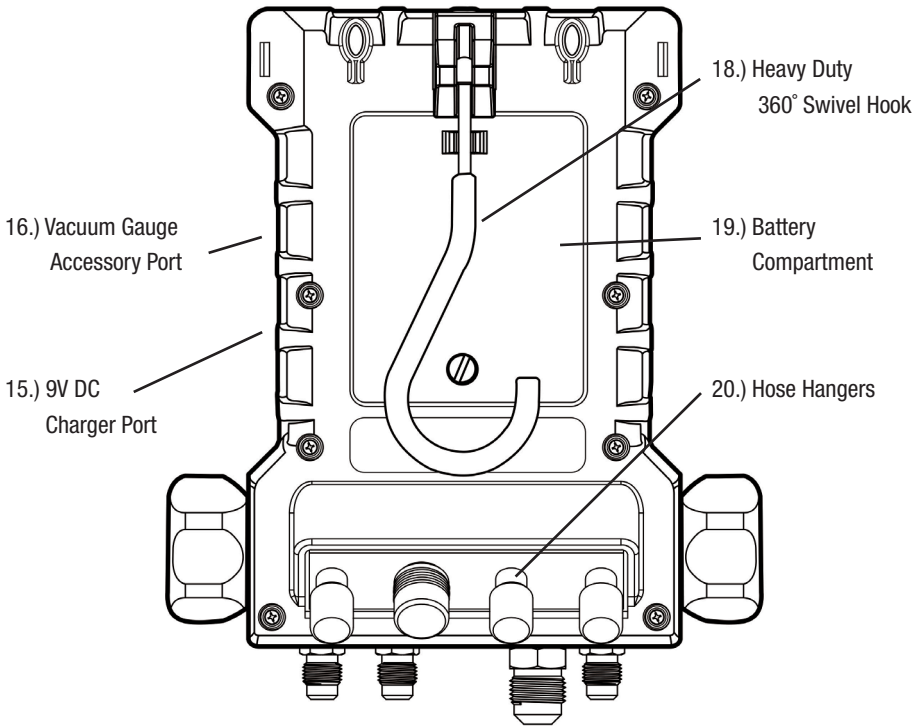


OPERATION

Controls / Features

Figure 3

4 Valve Manifold (Back)

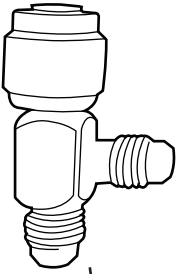


- 15. **9V DC Charger Port** - Connection for Accessory MDXBK
- 16. **Vacuum Gauge Accessory Port** - Connection for Accessory MDXVG
- 17. **Pipe Clamp Type Temperature Probes (not shown)** - Ideal for taking Superheat and Subcool true temperatures on round pipes, at any angle.
- 18. **Heavy Duty 360° Swivel Hook**
- 19. **Battery Compartment** - powered by 4 AA batteries.
- 20. **Hose Hangers** - For connecting ends of unused hoses.

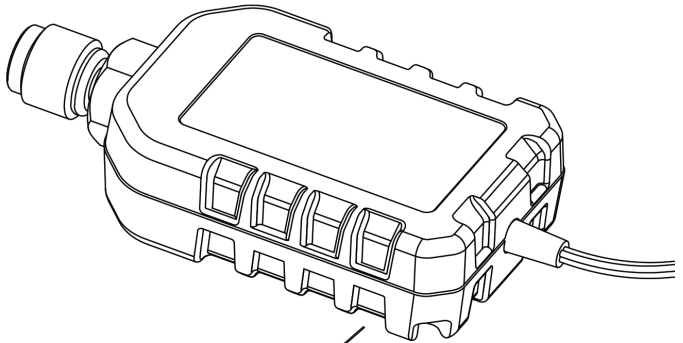
Controls / Features

Figure 4

Vacuum Gauge Accessory



22.) "T Fitting" (Optional)



21.) Vacuum Gauge Accessory (Optional)

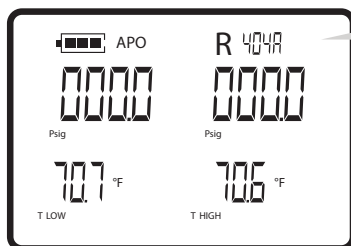
OPERATION

Initial Operation

1. To Select A Refrigerant Other Than One Shown- From Main Screen (**FIG. 1**), press **REF** to scroll through a list of 5 common factory programmed refrigerants.

Note: To change default refrigerants, go to page 16.

Note: Temperature probes must be connected to get a T Low and / or T High temperature reading.

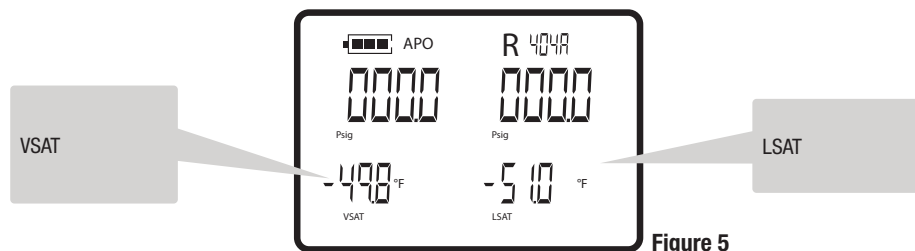


Refrigerants

Figure 1

Main Screen

2. To View vapor (**VSAT**) & Liquid (**LSAT**) Saturation Temperatures- Press **SH/SC**



VSAT

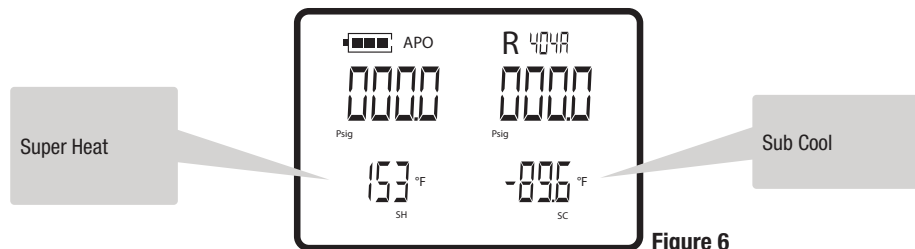
LSAT

Figure 5

Saturation Temperature Screen

3. Note: In this mode, and to prevent errors, refrigerant cannot be changed using **REF** key. Press **CLR** key to return to the **Main Screen** (**FIG 1**) from this view.

4. To View Superheat (**SH**) & Sub-cool (**SC**) Temperatures- Press **SH/SC** again.



Super Heat

Sub Cool

Figure 6


Super Heat, Sub Cool Screen

5. Note: In this mode, and to prevent errors, refrigerant cannot be changed using the **REF** key. Press **CLR** to return to **Main Screen** (**FIG 1**) from this view.

Initial Operation

Temperature Clamps - The enclosed clamps can be used to take temperatures of pipes or other round surfaces within its jaw range (1/8" to 1-1/8"). This greatly improves the calculation of Superheat & Subcool temperatures, as the sensor is virtually isolated from ambient conditions, allowing clamps to read true pipe temperatures while attached.

Operation - Plug one lead into the **LEFT** (Blue) socket and one lead into the **RIGHT** (Red) socket. Apply Temperature Clamps to system tubing and read the resulting display temperatures.

6. To Display Difference Between High & Low Side Temperatures- Press **SH/SC** again. Press **CLR** to return to **Main Screen (FIG 1)**.
7. To Turn Manifold Off- Press and hold the **ON/OFF**  key until the screen shows "**OFF**"

Setting to Zero Pressure

1. It is recommended the manifold be opened to the atmosphere before every working session. If display reads other than zero in the selected pressure units, zero can be re-set by pressing and holding CLR at main screen. **The Pressure Zero Screen (FIG 7)** appears and will then return user to **Main Screen (FIG 1)**, where both **Pressure Displays** should now read zero. This operation should be performed especially if manifold has been dropped or pressurized beyond 800 PSIG (55 bar) full scale.

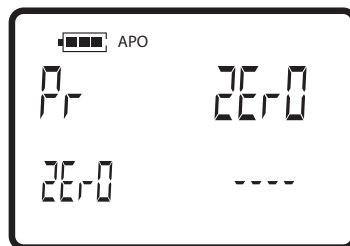


Figure 7

Pressure Zero Screen

OPERATION

Pressure Decay or Vacuum Decay Testing

MD100 and MD50 manifolds can perform **Pressure Decay and Vacuum Decay tests**. Test pressures and durations are fully settable by the user. Any test can be aborted at any time by pressing “CLR”.

Pressure Decay Test

A pressure decay test should be used to determine if a **large** leak exists (not to determine if no leak or small leaks exist). Electronic Leak Detectors are the only instrument to determine leak rates less than 1 oz./year. In practice there should be no pressure decay detected if the system is deemed leak proof enough to add refrigerant. Large leaks should be found before adding refrigerant. Low cost tracer gas mixtures such as 95% N2 & 5% H2 are popular and can be sensed by a CPS EMOS leak detector.

- 1) At **Main Screen (FIG 1)** press **TEST**. The **Test Pressure Set Screen** will appear (**FIG. 8**).
[Note: The **MDXVG** Vacuum Gauge accessory **should not be plugged in at this time**].

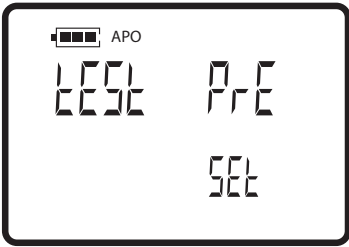


Figure 8

Test Pressure Set Screen

- 2) Press **SET** to advance to Test Time (Pressure) Set Screen (**FIG. 9**).

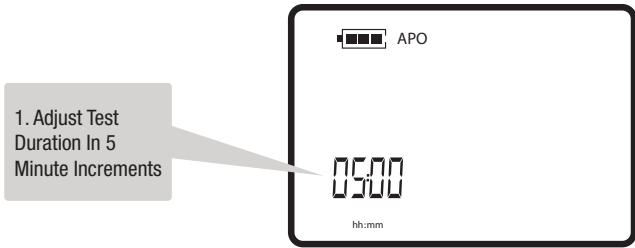
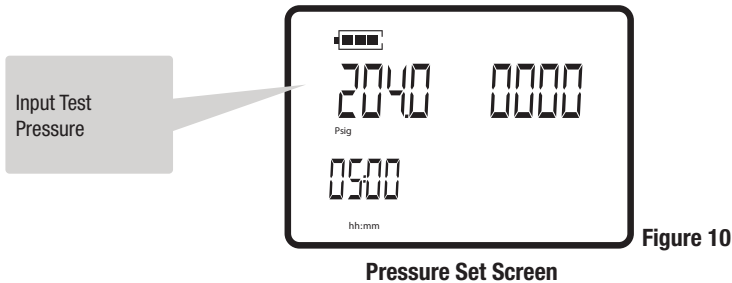


Figure 9

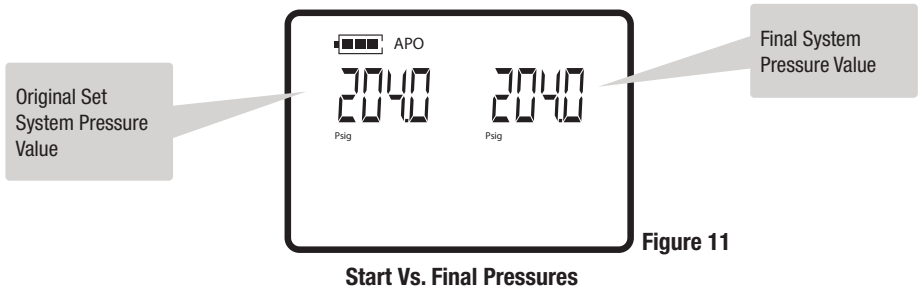
Test Time Pressure Set Screen

Pressure Decay or Vacuum Decay Testing (Cont.)

- 3) Use **UP/DOWN ARROWS** to adjust test duration in 5 minute increments to desired setting
(Note: Minimum time is pre-set at 5 minutes. Maximum time is 95 minutes).
- 4) Press **SET** to store **Test Duration**. Display will advance to **Pressure Set Screen (FIG 10)**.



- 5) Connect manifold Low and High Side Service hoses to the system to be tested. Pressurize the system. **Regulated** Nitrogen or Nitrogen/Hydrogen trace gas is recommended.
- 6) The pressure in the system will be displayed in the UPPER LEFT.
- 7) Press **SET** to start test. Starting test pressure is indicated in upper left display (**FIG. 10**). Current system pressure is shown in upper right display. Timer (lower left display) decrements and when at zero, a bell will sound indicating test completion and **Start Vs. Final Pressures** will be displayed (**FIG 11**) to determine if system leaks.



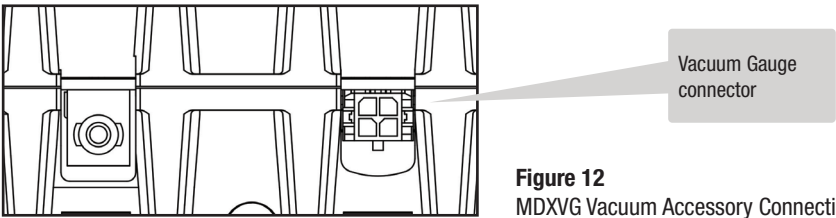
Vacuum Decay Test

Normally, systems with vacuum levels within 250-500 microns are deemed as having a good seal and are ready for charging. As with any recharged system, a good electronic leak detector should be used to test for leaks after the charge has been completed. MD50 or MD100 manifolds will function as accurate vacuometers when used with the **MDXVG Remote Vacuum Accessory (FIG. 4)**.

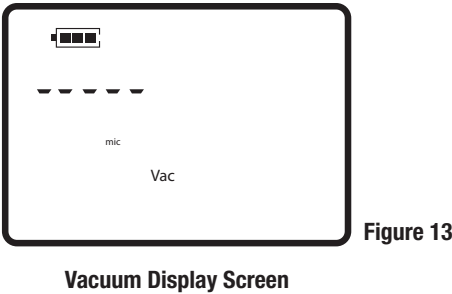
OPERATION

Pressure Decay or Vacuum Decay Testing (Cont.)

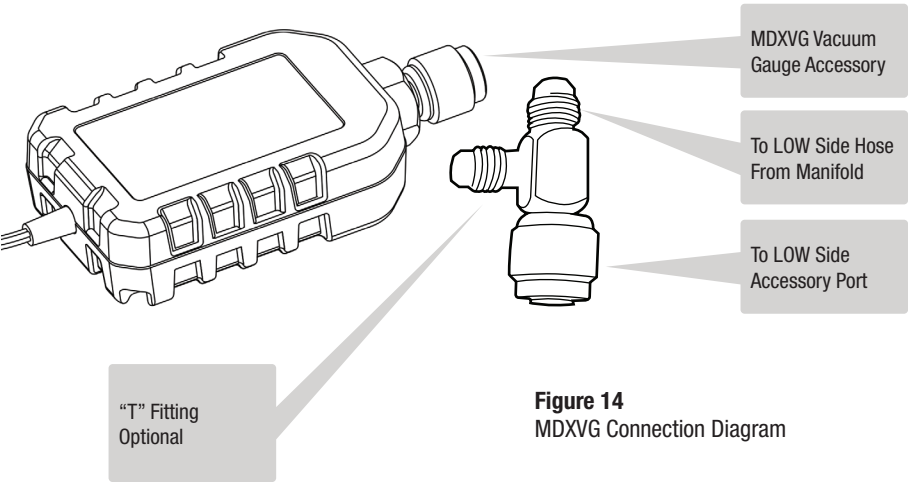
1. Plug the MDXVG Vacuum Accessory into the upper right side of the manifold (**FIG. 12**).



2. The **Vacuum Display Screen** (**FIG 13**) appears.



3. Properly connect the MDXVG with a "T" fitting directly to the AC system (**FIG 14**).



Pressure Decay or Vacuum Decay Testing (Cont.)

4. In this mode, the manifold will show current vacuum in the system. The display begins to show vacuum levels at 25000 microns or less and is accurate to +/- 10 microns. Continue to run vacuum pump until the desired vacuum level is reached. Once reached, proceed to Vacuum Decay Test.
5. **Vacuum Decay Test** - To perform this test, press **CLR** to go to the **Main Screen (FIG. 1)** Vacuum Gauge Accessory should still be plugged into manifold.
6. At **Main Screen (FIG 1)** press **TEST**. The **Test Vacuum Set Screen** appears (**FIG. 15**)

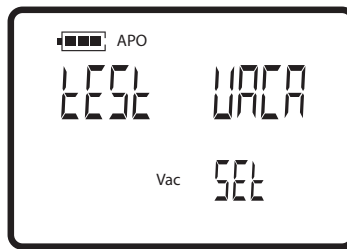


Figure 15

Test Vacuum Set Screen

7. Press **SET** to advance to Vacuum Decay Test –Time Set Screen (**FIG 16**).

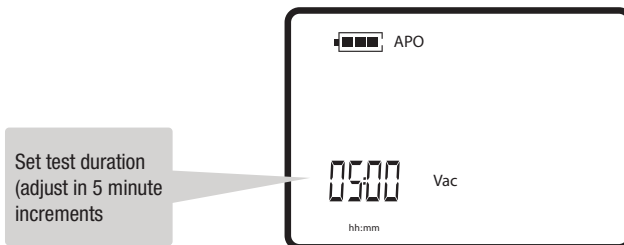


Figure 16

Vacuum Decay Test Time Set Screen

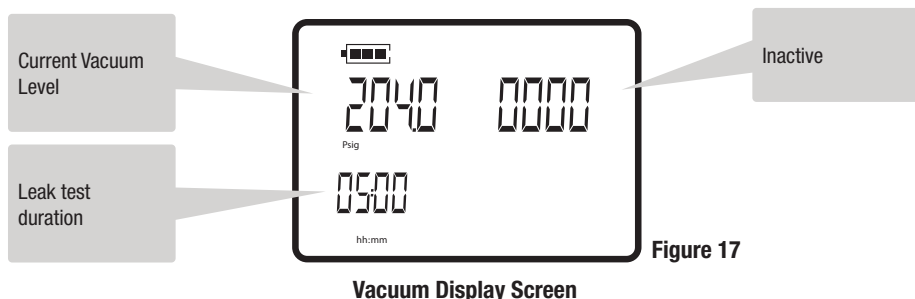
OPERATION

Pressure Decay or Vacuum Decay Testing (Cont.)

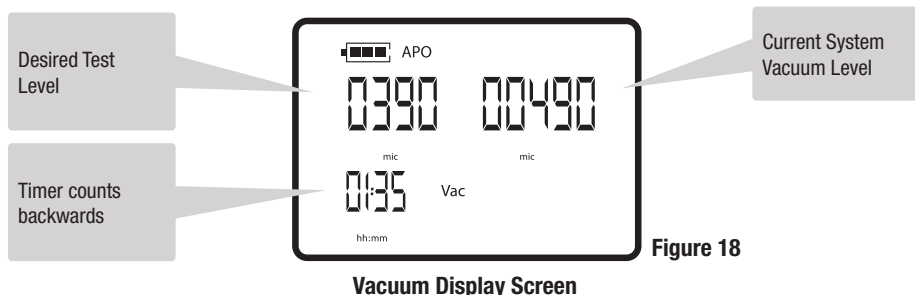
8. Use **UP/DOWN ARROWS** to adjust test duration in 5 minutes increments (minimum time is pre-programmed at 5 minutes).

- 1) Press **SET** to store Vacuum Test duration time. **Vacuum Decay Test Screen (FIG.17)** will now be displayed.

NOTE: The Vacuum Reading in the upper Left display is still active. The Reading in the upper Right display is not active unit steps 2 & 3 are completed.



- 2) Continue to Evacuate the system to the desired level which is indicated in the upper left display once the desired vacuum level is reached:
 - a. On the MD100, close the Vacuum Valve
 - b. On the MD50, close the High & Low side valves.
- 3) Press **SET** to start test. Starting test vacuum level is indicated in Upper Left Display (**FIG. 18**). Current system vacuum level is shown in upper right of display and timer is shown in lower left. The timer decrements and when zero, a bells sounds and test ends. At end of test, Start vs. Final Vacuum levels will be displayed to enable determination of any vacuum loss over a set period of time.



- 4) Push **CLR** to return to **Main Screen (FIG 1)**.

NOTE: If it is required to rerun the vacuum pump after STEP 3, disconnect and reconnect the MDXVG to reset it in the vacrometer mode.

Programming (Changing Units)

According to your geographic location, MD50 and MD100 manifolds are factory programmed with 5 common refrigerants in those regions (see chart below), and units of measure (Temperature, Pressure and Vacuum) for specific regions. See chart below for details.

Any of these units can be changed via the Program Mode.

PROGRAM MODE (To Change Units Or Set APO To ON Or OFF)

There are 2 major options. In each, a blinking symbol represents a choice the user can make by pressing **SET**.

1. **PrO** (Programming)

- Change Refrigerants:** Change any or all of 5 common refrigerants accessible at Main Screen.
- Change Temperature Units:** Change °F or °C.
- Change Pressure Units:** Change Psig, kPa, Mpa, bar and KgCm2 pressure units.
- Change Vacuum Units:** Change Microns vs. Hg vacuum units.

2. **APO (Set Automatic Power OFF)** - Manifolds come factory pre-set to ON.

Pre-Programmed Refrigerants

The following 5 common refrigerants have been programmed for easy access from the **Main Screen** using the **REF** key

PRE-PROGRAMMED REFRIGERANTS & UNITS OF MEASURE		
USA	AUSTRALIA	EUROPE
R-134a	R-134a	R-134a
R-22	R-22	R-404A
R-404A	R-404A	R-744 (CO2)
R-407A	R-744 (CO2)	R-410A
R-410A	R-410A	R-407c
PSIG, F, Micron	kPA, C, Micron	Bar, C, Micron

OPERATION

Programming (Changing Units) (Cont.)

To Change Refrigerants

The recommended way to change refrigerants involves making a new list of 5 refrigerants, and change all five of them in the same session. Example: If only R-22 needs to be changed to R-1234yf (and if using USA defaults), program the following items: R-410A, R-1234yf, R-404A, R-134a and R-407A.

- 1) At **Main Screen (FIG. 1)** press and hold **MODE** until “**PrO**” (**Program**) **Screen (FIG.18)** appears. “**PrO**” will blink.

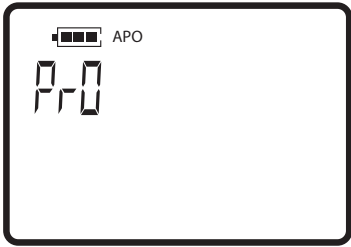


Figure 18

Program Screen

- 2) Press and hold **SET** to enter the Refrigerant Selection Screen (**FIG 19**).

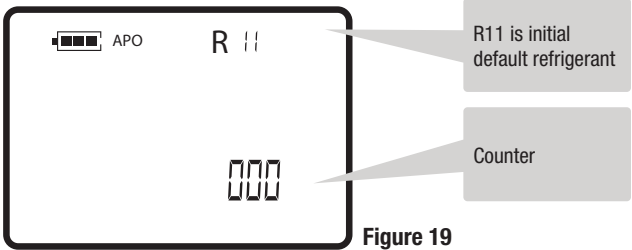


Figure 19

Refrigerant Selection Screen

- 3) The **Initial Refrigerant** (blinking in upper right) should be R-11 and Counter (Lower Right) should start at 000.
- 4) Use **UP/DOWN ARROWS** to scroll through 93 refrigerants. Press and hold either arrow to scroll through refrigerants progressively faster. Release to stop scrolling. Last refrigerant displayed will blink.

Programming (Changing Units) (Cont.)

- 5) To select refrigerant displayed, press **REF**. A tone will sound and counter will increment by one indicating that the first refrigerant in the sequence of 5 favorites has been replaced with one selected.
- 6) To select another refrigerant, repeat steps 3 and 4.
- 7) To exit this menu and go to the next (Temperature Units Screen), press **SET**, or
- 8) To return to **Main Screen (FIG. 1)**, press and hold **CLR** key after step 6.
- 9) If all 5 refrigerants are changed, manifold automatically advances to next menu without having to press **SET**. Main Screen (**FIG. 1**) can then be accessed by pressing and holding **CLR**.

To Change Temperature Units (°F vs. °C)

- 1) At Main Screen (**FIG. 1**) press and hold **MODE** until “**PrO**” screen (**FIG. 18**) appears. “**PrO**” will blink.
- 2) Press **SET** to enter “**PrO**” menu. The Refrigerant Selection Screen appears (**FIG. 19**).
- 3) Press **SET**. The Temperature Units Screen (**FIG.20**) will appear (blinking).

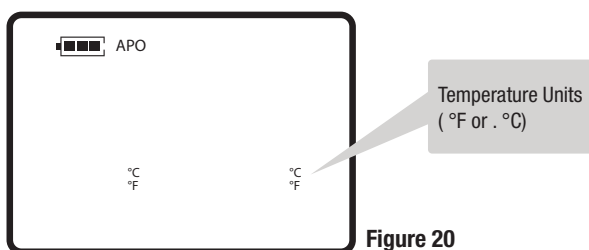


Figure 20

Temperature Units Screen

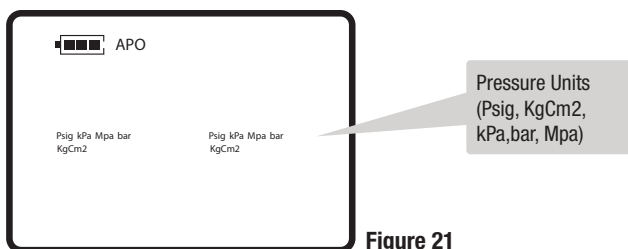
- 4) Press **SET** to select this menu. The symbol for the current units blinks.
- 5) Use **UP/DOWN ARROWS** to toggle between °F vs. °C
- 6) Press **SET** to select °F vs. °C and go to next menu (Pressure Units), or
- 7) To return to **Main Screen (FIG. 1)**, press and hold **CLR**.

OPERATION

Programming (Changing Units) (Cont.)

To Change Pressure Units (Psig, KgCm2, kPa,bar, Mpa)

- 1) At **Main Screen (FIG. 1)** press and hold **MODE** until “**Pr0**” **Screen** appears (**FIG 17**). “**Pr0**” will blink.
- 2) Press **SET**. The **Refrigerant Selection Screen** appears (**FIG. 19**).
- 3) Press **SET**. The **Temperature Units Screen** (blinking) appears (**FIG.20**).
- 4) Press **UP ARROW** to advance to **Pressure Units Screen (FIG. 21)**. See blinking symbols.



Pressure Units Screen

- 5) Press **SET** to select this menu. Current units blink.
- 6) Use **UP/DOWN ARROWS** to scroll through units (Psig, KgCm2, kPa,bar, Mpa)
- 7) Press **SET** to select pressure units desired and go to next menu (Vacuum Units), or
- 8) To return to **Main Screen (FIG. 1)**, press and hold **CLR**.

Programming (Changing Units) (Cont.)

To Change Vacuum Units (mic vs. inHg)

- 1) At main screen (**FIG. 1**) press and hold **MODE** until “**PrO**” screen (**FIG. 17**) appears. “**PrO**” blinks.
- 2) Press **SET** to enter “ **PrO**” Screen. The **Refrigerant Selection Screen** appears (**FIG. 19**).
- 3) Press **SET** to bypass Refrigerants Screen. The Temperature Units Screen (blinking) appears (**FIG. 20**).
- 4) Press **MODE** to advance to the **Pressure Units Screen** (**FIG. 21**).
- 5) Press **SET** to advance to **Vacuum Units Screen** (blinking) (**FIG. 22**).

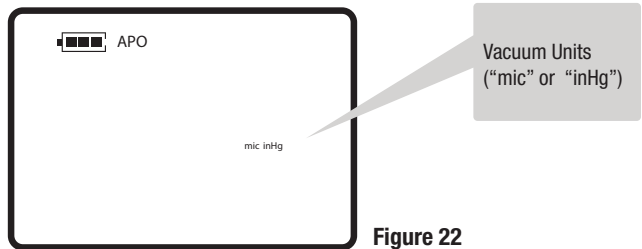


Figure 22

Vacuum Units Screen

- 6) Press **SET** to select this menu. Current units will blink.
- 7) Use **UP/DOWN ARROWS** to select either microns (mic) or inches of mercury (inHg).
- 8) Press **SET** to select desired units and go to next menu (Units Summary Screen), or
- 9) To return to the **Main Screen** (**FIG. 1**), press and hold **CLR**.

OPERATION

Programming (Changing Units) (Cont.)

To Enter Programming Changes (Make Changes Current)

- 1) The next menu item after selecting Vacuum Units is the **Units Summary Screen** (**FIG. 23**). Blinking symbols represents units chosen in previous steps.

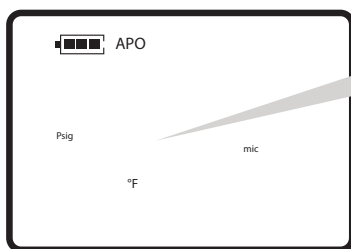


Figure 23

Units Summary Screen

- 2) Press **SET** to select units shown on this screen-making them the current working units.
- 3) Or after pressing **SET**, use **UP/DOWN ARROWS** to display previous units. These can be restored by pressing **SET** Menu. In either case, units become current units and manifold returns to **Main Screen** (**FIG. 1**)

Setting APO (Automatic Power) ON Or OFF

Setting Automatic Power ON/OFF (APO)

When **APO** is **ON** and there has been no user activity (usually 10-15 minutes), manifolds turn **OFF** to conserve battery power. About 1 minute before turning **OFF**, an alarm will sound to signify that override is possible by pressing any key, except the **POWER** key. This will re-start the **APO** timer. **APO** is suspended when performing either the vacuum or pressure decay test or when the unit is used as a vacuum gauge.

When **APO** is **OFF**, the user must turn a manifold off manually.

1. From **Main Screen (FIG. 1)**, press and hold **MODE**. The **PrO** icon will blink (**FIG 18**).
2. Press **DOWN ARROW** to go to (blinking) **Set APO** screen. (**FIG 24**).

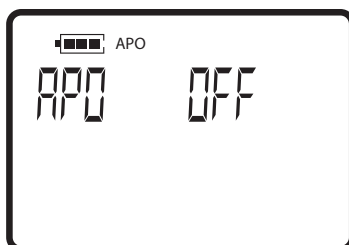
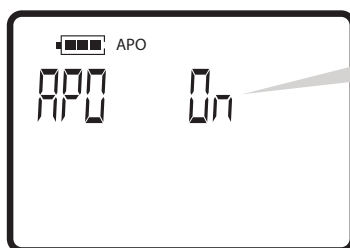


Figure 24

Set APO Screen

3. At **SET APO** Screen briefly press **SET**. “**APO On**” will appear and blink (**FIG 25**).



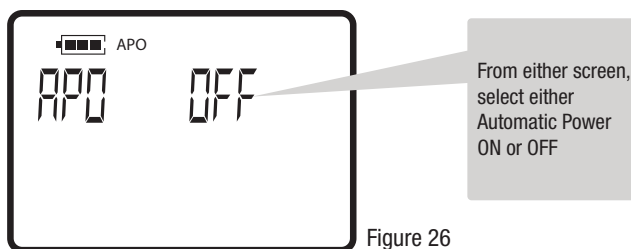
From either screen, select either Automatic Power ON or OFF

Figure 25

APO On Screen

OPERATION

Setting APO (Automatic Power) ON Or OFF (Cont.)

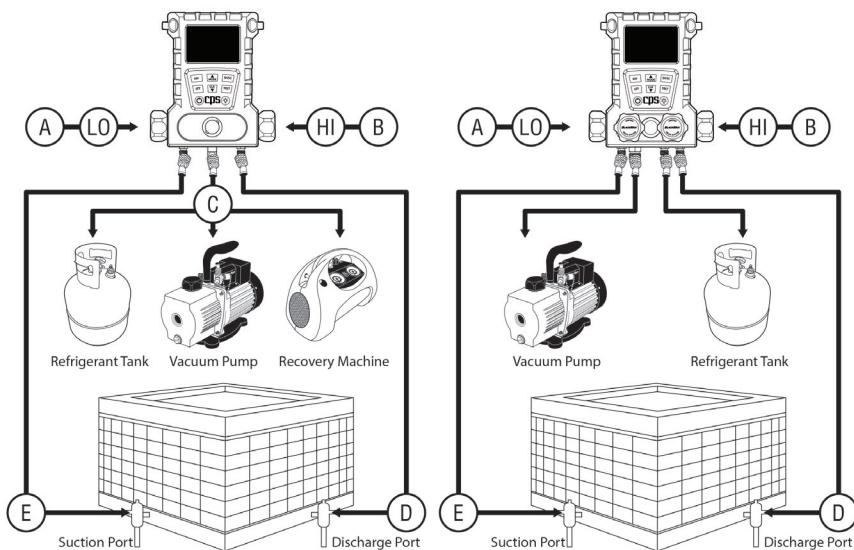


APO OFF Screen

4. Use **UP/DOWN ARROW** to change display from **APO On** (FIG 25) to **APO OFF** (FIG 26) as desired.
5. Press **SET** to select desired **APO** state and return to **Main Screen** (FIG 1)

Connecting To An AC System

Various service and test procedures below can be performed after your manifold has been properly connected to an AC system as shown:



RECOVER REFRIGERANT	
MD50 (2 Valve Manifold)	MD100 (4 Valve Manifold)
1. Connect Low (A) and High (B) Service hoses to service ports (E) & (D)	Connect Low (1) and High (2) Side Service hoses to equipment's service ports (L) & (H)
2. Connect hose from to open port on the tee(C) to Refrigerant Recovery Unit inlet port	Connect hose from port (4) to Refrigerant Recovery unit inlet port
3. Start Recovery Unit	Open low side valve (A)
4. Open low side valve (A)	Open high side valve (B)
5. Open high side valve (B)	Start Recovery Unit
6. Complete refrigerant recovery process.	Open valve (D)
7. Disconnect manifold from system.	Complete refrigerant recovery process. Disconnect manifold from system.
8. Proceed to the repair system, then go to Evacuation Procedure	Proceed to the repair system, then go to Evacuation Procedure

OPERATION

Evacuating Procedures

EVACUATING PROCEDURE	
MD50 (2 Valve Manifold)	MD100 (4 Valve Manifold)
1.) Connect Low (A) and High (B) Service hoses to service ports (E) & (D)	Connect Low (1) and High (2) Service hoses to service ports (L) & (H)
2.) Connect hose from tee (C) to Inlet port of Vacuum Pump. Use the fitting on the tee with the valve core.	Connect 3/8" hose from port (4) to Vacuum pump inlet port
3.) Connect another hose from the open port of tee (C) to the valve of a refrigerant supply tank. Supply tank valve must be off.	Connect another hose from port (3) to refrigerant supply tank's valve. Supply tank valve must remain off.
4.) Check Low and High Side pressure readings, if zero PSIG or lower continue. If pressure reads higher than 0 PSIG, run Refrigerant RECOVERY	Check Low and High Side pressure readings, if zero PSIG or lower continue. If pressure reads higher than 0 PSIG, run Refrigerant RECOVERY
5.) Once it is determine no refrigerant is present in system, start vacuum pump.	Once it is determine no refrigerant is present in system, start vacuum pump.
6.) Open low side valve (A)	Open low side valve (A) Open high side valve (B)
7.) Open high side valve (B)	Open valve (D) Open valve (C), but do not open supply tank valve.
8.) Note: A Vacuum Gauge (VG200) can be connected via service tee to equipment to monitor vacuum pump's progress.	Note: Optional Vacuum Gauge Accessory (MDXVG) can be connected via service tee to the equipment to monitor vacuum pump's progress.
9.) Evacuate system according to manufacturer's specifications; close high and low side hand knobs.	Evacuate system according to manufacturer's specifications; close high and low side hand knobs.
10.) Disconnect Vacuum Pump hose from valved port on Tee (C). The valve core will seal when hose is removed, thus preserving the vacuum.	Close valve (D) once the required vacuum level is reached. Turn off vacuum pump.

The unit is now ready for Vacuum Leak test or High Side Charging Procedure.

Low Side Charging Procedures

CHARGING PROCEDURE (Low Side Charging)	
MD50 (2 Valve Manifold)	MD100 (4 Valve Manifold)
1.) The following instructions are to add charge to a pressurized system, commonly known as “topping off”.	The following instructions are to add charge to a pressurized system, commonly known as “topping off”.
2.) Connect Low (A) and High (B) Service hoses to service ports (E) & (D). All valves should be closed.	Connect Low (1) and High (2) Service hoses to service ports (L) & (H)
3.) Connect a hose from the open port on tee (C) to valve fitting on supply tank.	Connect a hose from port (3) to refrigerant supply tank’s valve.
4.) Open supply tank valve. For blends, turn tank upside down or make sure liquid refrigerant is being charged.	Open supply tank valve. For blends, turn tank upside down or make sure liquid refrigerant is being charged.
5.) Push valve core on tee (C) until refrigerant comes out. This will purge the hose from the supply tank.	Open valve (C). With hose disconnect from port (4), slightly open valve (D) until refrigerant comes out. This will purge the hose from the supply tank.
6.) Turn refrigerant system on. Monitor pressure gauges. Use superheat and subcooling features to help determine when charge amount is optimal.	Turn refrigerant system on. Monitor pressure gauges. Use superheat and subcooling features to help determine when charge amount is optimal.
7.) Slightly open Low Side Valve (A) to allow liquid refrigerant to flow into low side of equipment. Caution should be used when charging liquid refrigerant into low side of a refrigeration system.	Slightly open Low Side Valve (A) to allow liquid refrigerant to flow into low side of equipment. Caution should be used when charging liquid refrigerant into low side of a refrigeration system.
8.) Close Low Side valve (A) when desired amount of refrigerant has been added. Note the use of a scale is required.	Close Low Side valve (A) when desired amount of refrigerant has been added. Note: The use of a scale is required.
9.) Let equipment temperatures and pressures stabilize. Check superheat and/or subcooling levels. Repeat charge if necessary.	Let equipment temperatures and pressures stabilize. Check superheat and/or subcooling levels. Repeat charge if necessary.
10.) Once done, close off supply tank valve and disconnect all hoses. Use Caution as all hose connections are under pressure.	Once done, close off supply tank valve and disconnect all hoses. Use Caution as all hose connections are under pressure.

Once charge is complete, an electronic refrigerant leak detector should be used to confirm no leaks exist.

OPERATION

High Side Charging Procedures

CHARGING PROCEDURE (High Side Charging)	
MD50 (2 Valve Manifold)	MD100 (4 Valve Manifold)
Continued from Evacuation Procedure above. High Side Charging should be done on a completely evacuated system.	Continued from Evacuation Procedure above. High Side Charging should be done on a completely evacuated system.
1.) A scale should be used to weigh in the charge. Place tank on scale so liquid refrigerant is supplied.	A scale should be used to weigh in the charge. Place tank on scale so liquid refrigerant is supplied.
2.) Open Supply tank valve to fill manifold with liquid refrigerant.	Open Supply tank valve to fill hose with liquid refrigerant.
3.) Set scale to record charge amount.	Set scale to record charge amount.
4.) Open High Side Valve (B). Monitor weight reading.	Open High Side Valve (B). Monitor weight reading.
5.) Once desired charge amount has been reached, close High Side Valve (B) and supply tank valve.	Once desired charge amount has been reached, close High Side Valve (B) and supply tank valve.
6.) Start refrigeration system. Open Low Side valve (A) to allow all remaining refrigerant in manifold and service hoses to charge into system.	Start refrigeration system. Open Low Side valve (A) to allow all the remaining refrigerant in manifold and service hoses to charge into system.
7.) Close Low Side Valve (A).	Close Low Side Valve (A) and Valve (C).
8.) Monitor Low and High Side pressures. Superheat and subcooling features of manifold can be used at this time.	Monitor Low and High Side pressures. Superheat and subcooling features of manifold can be used at this time.
9.) Disconnect service hoses from equipment. Use Caution as all hoses are under pressure.	Disconnect service hoses from equipment. Use Caution as all hoses are under pressure.

Once charge is complete, an electronic refrigerant leak detector should be used to confirm no leaks exist.

APPENDIX A (Manifold Specifications)

High side pressure range:	-14.7 to 800.0 PSIG (-1.0 to 55 bar)
Low side pressure range:	-14.7 to 800.0 PSIG (-1.0 to 55 bar)
Pressure reading accuracy:	+/- 1% of reading or +/- 0.5 PSIG (+/- 0.05bar)
Pressure reading resolution:	0.5 PSIG (0.05 bar)
High and low side burst pressure:	1500.0 PSIG (103.4 bar)
High side temperature range:	-58.0 °F to 302 °F (-50 °C to 150°C)
Low side temperature range:	-58.0 °F to 302 °F (-50 °C to 150°C)
Temperature reading accuracy:	+/- 0.36 °F (+/- 0.2°C)
Vacuum indication accuracy:	+/- 10 microns (requires MDXVG accessory)
SH, SC and saturation temperature accuracy:	+/- 0.5°F (+/- 0.3°C)
Instrument working temperature:	-4.0 °F to 122°F (-20°C to 50°C)
Instrument working RH range:	0% to 100% non-condensing.
Total number of stored refrigerants:	93
APO (Automatic Power Off):	10 minutes. Can be disabled by user.
MD100 size:	8.1 in. L x 3.5 in. H x 7.0 in. W
MD50 size:	8.1 in. L x 2.5 in. H x 7.0 in. W
MD100 weight:	3.3 lb.
MD50 weight:	3.0 lb.

Display Life**Using 4 industrial alkaline AA batteries (included):**

Backlight full ON:	25+ hours continuous duty
Backlight full OFF:	60+ hours continuous duty

Using 4 Rechargeable NiMH AA batteries (not included):

Backlight full ON:	20+ hour continuous duty from full charge
Backlight OFF:	50+ hours continuous duty from full charge

APPENDIX

APPENDIX B (MDXVG) Vacuum Gauge Accessory Specifications

SENSOR:

Type: Self - heated thermistor bridge with integral temperature compensation from 0 to 50 °C (32 to 122 °F).

Display pressure range: Two scales with auto-ranging; 0 to 9,990 microns with 10 micron resolution up-ranging to 9.90 to 25.90 Torricelli. Above 25.90 Torricelli the display shows -- -- -- -- Maximum Working pressure: 400 PSIG

ACCURACY:

+/- 10% of reading or +/- 10 microns, whichever is greater.

OPERATING TEMPERATURE RANGE:

Compensated (accuracy as stated): 0°C TO 50°C (32°F TO 122°F)

Non-compensated (add +/- 0.5% of reading error for every °C outside compensated range): -10 to 0°C (14 to 32°F)

OPERATING AND STORAGE HUMIDITY:

0 to 95%, non-condensing.

STORAGE TEMPERATURE:

-40 to 85°C (-40 to 185°F)

APPENDIX C (MDXBK) Charger Accessory Specifications

OPERATING TEMPERATURE RANGE: 0°C TO 50°C (32°F TO 122°F)

OPERATING & STORAGE HUMIDITY: 0-95%.

STORAGE TEMPERATURE: -40 to 85°C (-40 to 185°F)

POWER SOURCE: 100-240VAC input, 9VDC 2.0 amp maximum output

BATTERY TYPE: AA size, NiMH rechargeable, approximate battery life is 20,000 to 50,000 hours*

RECHARGEABLE BATTERY CYCLE LIFE: 1000 recharges

* based on useage with or without the LCD backlight energized.

APPENDIX D (Battery Selection and Replacement)

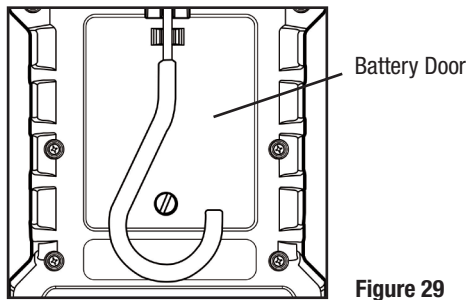
For optimum life and economic value, CPS Products, Inc. recommends that MD50 and MD100 Manifolds be powered by rechargeable NiMH (nickel metal hydride) batteries. CPS Products offers an optional “Charger Kit” (model **MDXBK**) that comes with a power adapter and 4 NiMH batteries. Do not connect the battery charger if there are no rechargeable batteries in the manifolds.

NOTE: Alkaline batteries should not, and cannot be charged in the MD50 or MD100.

Battery charge status is shown by the battery indicator symbol in the upper left (**FIG 1**) **Main Screen** and all other screens.

NOTE: A slight increase in temperature near the charging socket is normal.

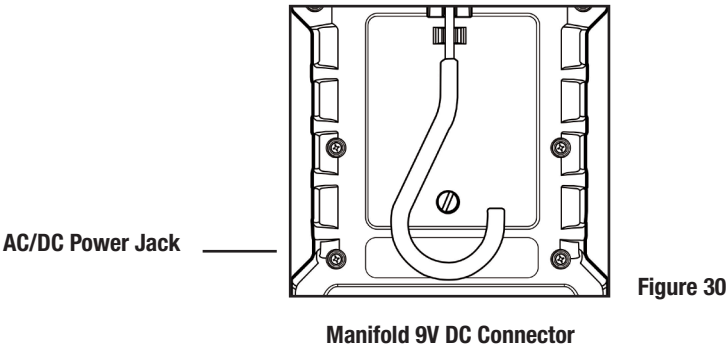
Remove battery door (**FIG. 29**) and install 4 AA size batteries, observing battery polarity.



Battery Installation

When using rechargeable batteries for the first time, turn manifold off and connect one end of charger to Manifold 9V DC plug (**FIG 30**) and the other end to an appropriate wall outlet socket. Charge NiMH batteries for 2 hours. The Battery Symbol on the display will blink during charging

APPENDIX D (Battery Selection and Replacement) (Cont.)



MD50 & MD100 manifolds can be used while charging the batteries, but charging time will be considerably extended. The preferred way to use the Rapid Charging Feature is to charge while the manifold is OFF.

APPENDIX E (Cleaning Sensor In MDXVG)

Sensor may become contaminated with dust, oil, etc. from pulling vacuums.

1. **Never use a cotton swab or similar object to clean the sensor. This may damage the sensor.**
2. Open all knobs, valves, and cap all the ports except for the VAC port.
3. Invert the MDXVG and add about 1 tablespoon of 100% denatured alcohol into the **VAC port (see FIG 2)** so as to flush out contaminants.
4. Gently shake the unit to produce a swirling effect of the alcohol inside the housing.
5. Turn right side up, open a port to pour out the rubbing alcohol.
6. Repeat the above procedure until the alcohol appears to be clean and clear of contaminants.
7. Check the gasket located inside the VAC port. If worn or deformed, replace with a new CPS gasket (PN: HXG)
8. Open all ports to allow sensors to air dry (usually about 1 hour). **DO NOT BLOW DRY.**

OPERATION

APPENDIX F (Limited Warranty)

BLACKMAX digital manifolds are covered by a CPS Products, Inc. LIMITED WARRANTY.

CPS Products, Inc. warrants, to the original purchaser, that its BLACKMAX line of digital manifolds and accessories are free from defects in assembly, materials and workmanship for **1 year** from the date of purchase, or **15 months** from the date of manufacture, whichever is sooner. If any BLACKMAX product is believed to be defective it must be returned to CPS Products. If the product is found to be defective, CPS will repair or replace the item(s), at our option, at no charge.

This warranty does not apply to products or accessories that have been altered, misused, submerged, exposed to extreme heat or cold, lightning strikes, or electrical voltage exceeding published product specifications. This warranty also does not apply to products that are simply in need of routine field service maintenance.

To assure your BLACKMAX purchase is on file with CPS Products, please fill in a Product Registration form and mail to CPS within 15 days from the date of purchase, along with a copy of the original sales receipt. Return of the registration form is not required to be covered by the Limited Product Warranty.

To process a warranty claim, please contact CPS USA at 1-800-277-3808 or CPS Products N.V. (Belgium) at (32) 3 281 30 40; or CPS Australia at 08 8340 7055, within 15 days of discovering defects in assembly, materials, or workmanship. CPS will provide a return authorization number (RGA #). Do not attempt to repair BLACKMAX products. CPS has the sole right to determine if a claim is valid and if compensation is justified.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER EXPRESS WARRANTIES. TO THE EXTENT ALLOWED BY LAW, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED TO THE DURATION OF THE LIMITED PRODUCT WARRANTY. IN NO CASE SHALL CPS PRODUCTS INC. HAVE ANY LIABILITY FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND, INCLUDING BUT NOT LIMITED TO: THE LOSS OF THE USE OF THE PRODUCT OR ANY ASSOCIATED EQUIPMENT, COST OF ANY SUBSTITUTED EQUIPMENT, FACILITIES OR SERVICES, DOWNTIME, THE CLAIMS OF THIRD PARTIES, DAMAGE TO PROPERTY OR PERSONAL INJURY. SOME JURISDICTIONS DO NOT ALLOW LIMITS ON WARRANTIES OR ON REMEDIES FOR BREACH IN CERTAIN TRANSACTIONS. IN SUCH JURISDICTIONS, THE LIMITS IN THIS PARAGRAPH MAY NOT APPLY.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION.

APPENDIX G (REFRIGERANTS STORED IN MD50 & MD100 MEMORY)

MD50 and MD100 manifolds are pre-loaded with 93 of the most common refrigerants.

R11	R401A	R421A
R113	R401B	R421B
R114	R401C	R422A / M079
R115	R402A	R422B
R116	R402B	R422C
R12	R403A	R422D / M029
R123	R403B	R423A / 39TC
R123A	R404A	R424A
R1234YF	R405A	R425A
R124	R406A	R426A
R125	R407A	R427A / M089 / FX100
R1270	R407B	R428A
R13	R407C	R434A
R134	R407D	R437A / M049PLUS
R134A	R407F	R438A / M099
R13B1	R408A	R500
R141B	R409A	R501
R142B	R41	R502
R143	R410A	R503
R143A	R410B	R504
R152A	R411A	R507 or R507A
R176	R411B	R508A
R21	R412A	R508B
R218	R413A / M049	R509 or R509A
R22	R414A	R600
R23	R414B	R600A
R236ea	R415A	R601
R236FA	R416A	R601A
R245ca	R417A / M059	R744 (Sub-critical range only)
R245fa	R418A	
R290	R419A	
R32	R420A	

APPENDIX H (ERROR INDICATOR SCREENS)

If certain malfunctions occur, MD50 and MD100 will display error messages:

oP -Appears in display areas reserved for temperature readings when temperature probe connected to that port is open circuited or not connected. Replace probe with CPS model number TMX2C.

SP -Appears in display areas reserved for temperature readings when temperature probe connected to that port is short circuited. Replace probe with CPS model number TMX2C.

Err (Upper Left Display) - Appears in upper left display when T function is selected and one or both temperature probes is defective as indicated by oP or SP indicators mentioned above.

Err (Lower Left Display) -Appears in display areas reserved for temperature readings when user tries to read saturation temperatures and calibration of pressure channels is invalid. This defect requires manifold be returned to factory.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

BLACKMAX

Digital Manifold Series

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